

KREGEL WINDMILL COMPANY FACTORY
1416 Central Avenue
Nebraska City
Otoe County
Nebraska

HAER No. NE-8

HAER
NEB
66-NEBC1,
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PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
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HISTORIC AMERICAN ENGINEERING RECORD
KREGEL WINDMILL COMPANY FACTORY

HAER
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HAER No. NE-8

Location: 1416 Central Avenue, Nebraska City, Otoe
County, Nebraska

Date of Construction: 1903

Builder: George F. Kregel

Present Owner: Kregel Windmill Museum Company

Present Use: Preserved as a museum

Significance: The Kregel Windmill Company factory is the last preserved intact windmill factory in the United States. The company was founded in 1879, and began to manufacture wooden windmills known as the "Kregel." By the last decade of the nineteenth century, the company was producing steel windmills sold under the name "Eli." Company founder George F. Kregel moved the factory to its present location in 1903, where he manufactured windmills through World War II when materials rationing forced him to stop production. After the war George's son Arthur took over the business and focused on water well and pump services.

Project Historian: T. Lindsay Baker, Baylor University,
Waco, Texas, 1995

Project Information: The Kregel Windmill Company Factory Recording Project is part of the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering, industrial, and maritime sites throughout the United States. HAER is administered by the National Park Service, U.S. Department of the Interior. The project was cosponsored by HAER during the summer of 1994 and the River Country Industrial Development Corporation, Nebraska City, Nebraska, Nancy Hoch, President. The field work, photographs, and historical reports were prepared under the direction of Eric DeLony, HAER Chief and Principal Architect. Large-format photography was done by Jet Lowe, HAER Photographer. Dr. T. Lindsay Baker, Baylor University, prepared the written report and photo captions. Additional technical assistance was provided by John Bowditch, curator, Henry Ford Museum, Dearborn, Michigan. Wendy Telford, architectural student at the University of Nebraska, Lincoln, served as an intern on the project.

HISTORY

Stop working for the oil kings!
Use the wind to pump water,
and save time and money.¹

The preceding statement was found on a 1924 handbill advertising the "Eli" windmill, a classic example of a windmill manufactured and distributed on a small scale for a limited geographical area. Its factory today is the last preserved intact historic windmill factory in the United States and is listed on the National Register of Historic Places.

The Eli and its predecessor windmills were manufactured in Nebraska City, the seat of Otoe County on the Missouri River in northeastern Nebraska, from the late 1870s into the World War II years. Eli mills are striking in design, exhibiting several features seen only rarely in other American windmills.

The Kregel Windmill Company began the manufacture of windmills almost immediately after forming on August 29, 1879.² The initial windmills, with wooden wheels and vane assemblies, were sold under the name, "Kregel," but by the late nineteenth

¹Kregel Windmill Company, Nebraska City, Neb., Stop Working for the Oil Kings! (Nebraska City, Neb.: Kregel Windmill Co., [1924]), handbill, Kregel Windmill Company Papers, Nebraska State Historical Society, Lincoln, Nebraska.

²Kregel Windmill Company, Nebraska City, Neb., day books (19 August 1879-17 July 1888), p. 1, Kregel Windmill Company Papers.

century the company was marketing mills known as "Eli" with steel wheels and vane sheets. With gradual modifications, these Eli windmills remained in production until rationing of raw materials during World War II forced the company to cease their manufacture.

During the decade of the 1890s principal stockholder George F. Kregel gave his windmill business address as 1401 Central Avenue in Nebraska City. It was here that he and his brother, Louis, operated the Nebraska City Manufacturing Company. Here (today the site of the Nebraska City city hall and fire station) the two brothers produced a breaking plow and other agricultural goods. Louis later moved to St. Louis to enter the casket business, leaving his brother to pursue windmills.

George F. Kregel moved his windmill business to its present location at 1416 Central Avenue about 1903. The purpose-built structure is a single story wood frame building covered with galvanized sheet steel siding. At some date a large shed room with dirt floor was added to the north rear of the rectangular building to house a well service branch of the operation. After windmill manufacture ceased during the 1940s, the company (in the hands of George Kregel's son, Arthur) began focusing its efforts on water well and pump service, and it remained an active business enterprise until 1990. After the death of Arthur Kregel and his wife, Louise, the factory and its contents passed from the heirs to a local non-profit historic preservation group,

which is preserving the factory as a museum.³

Eli windmills, manufactured for approximately four decades, have a number of striking design features. All of the Eli mills are direct-stroke machines; that is, one revolution of the wind wheel produces one stroke of the pump in the well underground. There are no gears whatever. The Eli, in fact, has a remarkably simple design. At the back of the main shaft, which passes through babbitted bearings, is a crank plate. To this crank

³"Arthur M. Kregel," Nebraska City News-Press (Nebraska City, Neb.), 30 July 1991; T. Lindsay Baker, "'Eli' and the Kregel Windmill Company," Windmillers' Gazette (Canyon, Tex.) 5, no. 3 (Summer 1986): 1-5; Phyllis Buell, "Kregel Keeps Wheels Turning in Business," The Penny Press (Syracuse, Neb.), 27 June 1988, Nebraska City Edition; Dorene Duffey, "Art Kregel Operates City's Oldest Business," Nebraska City News-Press, 1 September 1982; "Kregel Windmill Company[,] Manufacturers of Eli Windmills, Steel Towers, and Tanks, Nebraska City, Nebraska," The Nebraska Manufacturer (Lincoln, Neb.) 10, no. 2 (July 1923): unpaginated; "Kregel Windmill Factory Gaining National Attention," Nebraska City News-Press, 11 June 1992; Mike Mulvey, "Art Kregel's Windmill Business Is Suffering a 41-Year Drought," The Lincoln Star (Lincoln, Neb.), [unidentified date probably in 1986], available as clipping in Kregel Windmill Company vertical file, Nebraska City Public Library, Nebraska City, Neb.; Nebraska City 1854 1954 (Nebraska City, Neb.: Women's Division of the Chamber of Commerce, 1954), p. 59; David Ochner, "Frozen in Time: Windmill Factory Now a Nebraska Treasure," Historic Preservation News (Washington, D.C.) 32, no. 1 (January 1992): 14, 20; Dan Swanson, "Experts Explore Windmill Factory," Nebraska City News-Press, 11 July 1994; Dan Swanson, "Kregel Windmill Factory Museum Sakes Step Forward with Donation," Nebraska City News-Press, 18 June 1992; Dan Swanson, "Photographer Documents Windmill Factory," Nebraska City News-Press, 17 June 1994; U.S., Department of the Interior, National Park Service, National Register of Historic Places, Nomination for Kregel Wind Mill Company, 1993, Office of the Keeper of the National Register of Historic Places, Washington, D.C.; U.S., Department of the Interior, Patent Office, Patent No. 1,058,603, 8 April 1913, G. F. Kregel, Windmill Pitman, U.S. Patent and Trademark Office, Washington, D.C., and Kregel Windmill Company Papers.

plate a metal pitman is attached with a steel wrist pin employing a bronze bushing as its bearing. The pitman extends downward through a 2-1/2" inside-diameter mast pipe to connect with the wooden pump rod. The pitman itself is fitted with a swivel about midway down its length. (George F. Kregel patented this swivel device on April 8, 1913).

Two principal castings compose the "head" of the Eli. The larger of the two is attached firmly to the mast pipe and it supports the vane assembly. The smaller of the two castings, which can swivel 90 degrees on the top of the mast pipe, supports the wheel, main shaft, and crank plate.

Regulation to protect the windmill from self-destruction by centrifugal force during wind storms is through the combination of a slightly offset wheel with a vane assembly, which serves an additional role as a governor weight. The main shaft is set about 2" to one side. In this position it automatically pivots away from increasing winds, while the vane remains constantly parallel with the wind. As the wheel turns away from the higher winds, the end of the hinged vane assembly rises. When the wind speed subsides, the weight of the vane assembly draws the wheel back to face the wind more squarely, giving the mill a more-or-less regular rate of operation. When the mill is turned off by an operator who pulls a cut-off wire from the ground, pulling the wheel and vane into a parallel position, a friction brake rubs on the crank plate to prevent the wheel from "feathering" around in

the wind.

The wheel on the Eli contains one of its most striking design elements. Unlike virtually all other windmills manufactured in North America, the Eli has blades mounted behind the outer wheel rims. Almost every other windmill has outer rims which pass through openings in the blades or are positioned behind the blades. The Eli is different.

While the blades are riveted to the inner rims in a conventional manner, the outer ends of the blades are riveted to "L"-shaped galvanized steel brackets which hold them in a position completely behind the outer rims. The maker claimed that this design was superior because the "L"-shaped brackets reinforced the blades to within 7" of their tips and avoided weakening the blades with large holes for rim mounting. Although the design is unusual, one cannot help but be impressed by the large proportion of wheels which have survived intact on derelict Eli mills observed in the field

Eli windmills were manufactured with both 8-1/2' and 10' diameter wheels. The 8-1/2' mills have a total of thirty blades, and the 10' mills have thirty-six. These blades are comparatively long and narrow in profile, aiding in the identification of Eli mills. The earliest steel Eli mills have one crimp toward the end of the tip of the blades for reinforcement, while the more recent examples have two parallel crimps for stiffening.

There are several keys to the approximate dating of individual windmills made by the Kregel firm. The earliest examples had wooden wheels and vanes. Wooden foundry patterns for some of these early mills are preserved in the factory building. These mills were supplanted in the 1890s with Eli mills having steel wheels and vane sheets mounted on wooden wheel arms and vane stems.⁴

About 1920 the Kregel Windmill Company introduced a number of new design elements into its Eli windmill line. In order to compete with oil-bath (self-oiling) windmills made by larger windmill companies which had come to dominate the market, the old style grease cup lubrication on the Eli mills was replaced with an oil reservoir beneath the main shaft attached to the two-part main casting. From the main shaft oiling rings dipped down into this long, enclosed reservoir to carry lubricant up to the main shaft and its babbitted bearings. A chain lift oiler was added to lubricate the upper pitman bearing at the crank plate. Even

⁴Baker, "'Eli' and the Kregel Windmill Company," 1-5; G. F. Kregel, Nebraska City, Neb., G. F. Kregel, 1412 Central Avenue. Nebraska City, Neb., [] Manufacturer of Eli Galvanized Wind Mills... (Nebraska City, Neb.: Western Printing Co., [ca. 1905]), folder, Kregel Windmill Company Papers; G. F. Kregel, Nebraska City, Neb., G. F. Kregel [] Maker of Eli Galvanized Wind Mills... (Nebraska City, Neb.: G. F. Kregel, [ca. 1905]), folder, Kregel Windmill Company Papers; Kregel Windmill Company, Nebraska City, Neb., The Eli Mill Is Different from All Other Makes (Nebraska City, Neb.: Kregel Windmill Company, [ca. 1910]), folder, Kregel Windmill Company Papers; Kregel Windmill Company, Nebraska City, Neb., Water Pumping Pointers! (Nebraska City, Neb.: Kregel Windmill Co., [ca. 1920]), Kregel Windmill Company Papers.

before these changes, the mills began to be equipped with ball-bearing turntables.

The castings for the Eli windmills were produced by foundries in both Omaha and Nebraska City, Nebraska. The rough castings came to the factory at 1416 Central Avenue, where they were smoothed, machined, and finished. There all the steel parts were fabricated, bearings poured, and components assembled. Most of the mills sold went to consumers within about a sixty-mile radius of Nebraska City, but some mills went to customers in more distant locales. The company also fabricated its own line of prefabricated angle steel windmill towers and its own galvanized sheet steel water tanks. Both of these auxiliary products today may be found in the field in association with the windmills.⁵

The physical plant of the Kregel Windmill Company, now preserved by the Kregel Windmill Museum Company, a non-profit historic preservation organization, is preserved today much as it appeared when in operation half a century ago. Virtually all of the historic machinery remains in place, while its complete business records (contained in sixty archives cartons plus

⁵Baker, "'Eli' and the Kregel Windmill Company," 4; Kregel Windmill Company, Nebraska City, Neb., (Dealers) Eli Mill & Tower Price List 9/1/1927 (Nebraska City, Neb.: Kregel Windmill Co., 1927), advertising card, Kregel Windmill Company Papers; Kregel Windmill Company, Nebraska City, Neb., Eli Construction (Nebraska City, Neb.: Kregel Windmill Company, [ca. 1925]), folder, Kregel Windmill Company Papers; Kregel Windmill Company, Nebraska City, Neb., Oiling Directions for Eli Direct Stroke Mills (Nebraska City, Neb.: Kregel Windmill Co., [ca. 1930]), handbill, Kregel Windmill Company Papers.

oversize materials) from 1879 to 1990 have been transferred to the Nebraska State Historical Society, where they are available for research. Inside the factory the punches, cutters, presses, lathes, and other machines stand at the ready, almost giving the appearance of being idle only while the workers are away for lunch.⁶

⁶Baker, "'Eli" and the Kregel Windmill Company," 4-5; T. Lindsay Baker, "Four New Windmill Museums," Windmillers' Gazette (Rio Vista, Tex.) 13, no. 2 (Spring 1994): 8-9; T. Lindsay Baker, "Kregel Windmill Company Papers Find Archival Home," Windmillers' Gazette 14, no. 1 (Winter 1995): 7-9; Larry Fruhling, "Past Is Only on a Coffee Break at Dormant Windmill Factory," Des Moines Register (Des Moines, Iowa), 2 October 1994; U.S., Department of the Interior, National Park Service, National Register of Historic Places Nomination for Kregel Wind Mill Company.

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